



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 09/965,426  
Applicant : Gary R. DelDuca *et al.*  
Filed : September 27, 2001  
Title : Modified Atmospheric Packages and Methods for Making the Same  
  
TC/A.U. : 1761  
Examiner : Jyoti Chawla  
  
Docket No. : 47097-01106USC1

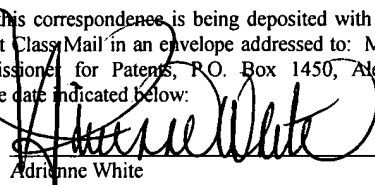
**FOURTH DECLARATION OF GARY R. DELDUCA  
UNDER 37 C.F.R. § 1.132**

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313

**CERTIFICATE OF MAILING  
37 C.F.R. 1.8**

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as First Class Mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313 on the date indicated below:

5/24/2006  
Date

  
Adrienne White

Dear Commissioner:

I, Gary R. DelDuca, declare that:

1. I hold a degree of B.S. in Mechanical Engineering From Rochester Institute of Technology in Rochester, New York that was obtained in 1980.

2. From 1980-1995, I worked as a developmental and senior engineer for Mobil Chemical Company, Plastics Division. As a developmental engineer, I worked in process and product development in the area of foam products. As a senior engineer, some of my responsibilities included designing specialized machinery that included machinery directed to stacking trays for meat processes. Mobil Chemical Company, Plastics Division was purchased by Tenneco Inc. in 1995. From 1995 to the present, I have been a Technical Manager for Tenneco Packaging Inc. in the area of modified atmosphere packaging (MAP) for meats. My responsibilities have included designing, developing, and implementing such modified

atmosphere packaging for meat and processes using the same. In 1999, Tenneco Packaging Inc. was renamed Pactiv Corporation.

3. I am aware of the Office Action dated February 24, 2006 and have read the portion of the Office Action discussing the phrase “turns brown in a natural time period.” This phrase is used in independent claims 38, 76, 119 and 138 and disclosed in the patent application at, for example, page 11, line 29 – page 12, line 15.

4. The phrase “turns brown in a natural time period” is a phrase that is used and understood by those skilled in the art. This phrase has been used in correspondence related to meat-packaging systems between retailers and myself. Specifically, this phrase has been used by those skilled in the art in the context of the color of the meat pigment. It is important to retailers and food packers that the color of the meat pigment not be fixed and turns brown in a natural time period.

5. One example of this phrase being used in the published literature is shown in Exhibit A (Principles and Applications of Modified Atmosphere Packaging of Food). On page 283, the literature discusses the effect of the meat turning brown in connection with conventionally overwrapped trays and also discusses that the color stability is limited on the shelf-life depending on type of meat (muscle).

6. The portion “turns brown” of the phrase “turns brown in a natural time period” means that the piece of meat has some brown, but does not mean that the piece of meat has to be 100% brown. Retailers and food packers use the phrase “turns brown” in the context of whether most customers would consider the color of the meat pigment undesirable such that the customers would not purchase the meat. The phrase “turns brown” is frequently used by retailers and food packers and, thus, is not indefinite.

7. The term “natural time period” of the phrase “turns brown in a natural time period” cannot be uniquely defined because the color of the meat pigment varies between the type of meat and the conditions for displaying such meat. *See* page 20, lines 17-26 of the present application (“The display times varied based on product type, initial microbial loads and storage conditions.”). The natural time period for the meat pigment turning brown is not the same between ground beef, strip loins (strip steaks), inside portion of inside round steaks, outer portion of inside rounds steaks, and tenderloins. For example, the natural time period in which the meat

pigment turns brown is about 4 days for strip steaks, while the natural time period in which the meat pigment turns brown for tenderloin is about 1 day.

8. I am not aware of any standard test for determining the color of the meat pigment. The most common type of testing for determining the color of meat pigment is a visual inspection to determine whether the color of the meat pigment is acceptable for sale. As discussed in the patent application, the color of the meat pigment can be visually determined. Page 20, line 27 – page 21, line 6 of the present application. In the examples of the present application, the color of the meat pigment was visually determined using a five-point scale where 1 = very bright red, 2 = bright red, 3 = slightly dark red or tan, 4 = moderately dark red or tan, and 5 = extremely dark red or brown. Page 20, lines 28-30 of the present application. If the score was 3.5 or less, than it was visually determined that the meat pigment was an acceptable color. Page 20, lines 30-31 of the present application.

9. Alternatively, there are other tests that are used to determine the redness of the meat pigment. One example of a test for redness was disclosed in the present application at page 21, lines 7-16. In this test, examples were instrumentally analyzed for redness ( $a^*$ ) using a colorimeter or photometer. *See* page 21, lines 8-11 of the present application. Normally,  $a^*$  values (higher values indicate more redness) are highly correlated to visual appraisal. Page 21, lines 12-13 of the present application. This type of test is not more accurate than a visual inspection by those skilled in the art because the color of the meat pigment does not degrade in a uniform fashion. Thus, some portions of the meat pigment may be brown and other portions of the meat pigment may be red, which may make the  $a^*$  test less accurate than visual inspection.

10. In summary, the phrase “turns brown in a natural time period” as used in the context of independent claims 38, 76, 119 and 138 is understood by those skilled in the art and is not an indefinite phrase in this context.

11. In the Office Action dated February 24, 2006, it is stated that Woodruff “provide[s] evidence that CO is removably associated with a meat surface.” Page 9. The Office Action continues by stating that “Woodruff recommends CO treatment at 0.5% volume and teaches storage of the meat at 29-40°F (column 2, lines 50-60) and for different time periods (Examples 1-VII) for meat treatment and storage and his results teach the reversibility of carboxyhemoglobin/carboxymyoglobin.” Page 10. The Office Action then concludes that

Woodruff does not teach “the presence of stable bright color of meat that lasted beyond the time of spoilage (i.e., permanent binding of CO with meat pigment.)” *See* page 11.

12. Woodruff does not teach or suggest that the color of the meat pigment turns brown in a natural time period. For example, Woodruff in Example 1 discloses a 0.5 lb. beefsteak that was exposed to 0.5% CO, which was nearly all absorbed two days later. *See* col. 4, lines 34-48. After being exposed in a modified atmosphere that included 16% oxygen, “the beefsteak retained its good red color, and the carboxymyoglobin color had penetrated no more deeply than it had at the end of the two days.” *See* Col. 4, lines 49-54. This passage implies that the carboxymyoglobin color was still retained within the beefsteak after 6 days despite being exposed to an atmosphere with a generally similar amount of oxygen as in air (compare about 21% oxygen to 16% oxygen). It would be expected to one skilled in the art that the beefsteak would turn brown in about 2-3 days, depending on the cut of meat. Thus, this example clearly shows that the beefsteak of Woodruff in Example 1 did not turn brown in a natural time period, but rather “fixed” the color of the meat pigment. Similarly, in Example 1 of Woodruff, a 0.5 lb. beefsteak exposed to 2.5% CO under similar conditions also retained its good color after 6 days. *See* col. 4, line 55- col. 5, line 6.


13. None of the other examples of Woodruff supports a modified atmosphere package wherein the CO associated with the raw meat is adapted to be removed such that the color of the meat pigment is not fixed and turns brown in a natural time period. Rather, the other examples of Woodruff generally disclose the condition of the meat pigment while being stored in a modified atmosphere containing CO.

14. In summary, Woodruff does not disclose, teach or suggest that the use of CO on meat pigment turns brown in a natural time period, but rather Woodruff teaches and suggests “fixing” the color of the meat pigment in Example 1.

15. In the Office Action dated February 24, 2006, it is stated that Koch "do[es] not teach the right size of the meat, Koch et al., teach the use of their package for primal as well as the final cuts (column 3, lines 4-17)." Page 11. Koch discloses that "[o]f course, if desired, the final cuts rather than just the primal cuts may be individually wrapped in the cover such as shown in FIGS. 1 and 2, this cover preferably being replaced with a conventional cover by the retailer." Col. 3, lines 13-16. This passage, however, does not disclose, teach or suggest that the color of the meat pigment is not fixed and will turn brown in a natural time period. Furthermore, this passage has nothing to do with the statement in the Office Action directed to Koch on the meat color ("Koch et al. teach a meat surface that has been exposed to CO for 7 days during storage under a modified atmosphere will remain red in color for 3 days after being removed from the modified atmosphere package[] and packaged in conventional wrapper at the retail outlet"). See page 6 of the Office Action. Rather, Koch discloses "[w]hen the primal cuts arrive at the retail outlet, the covers are removed and the meat is cut into individual steaks, roasts, etc. which may be separately wrapped in conventional wrapping materials. It has been found that meat will release a saleable red color for as long as 10 days when covered with the cover herein described for the first seven days and with a conventional cover for the remaining days."). Col. 3, lines 5-13 of Koch (underlining added).

16. I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true; and, further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 5/24/2006

  
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Gary R. DelDuca

# PRINCIPLES AND APPLICATIONS OF MODIFIED ATMOSPHERE PACKAGING OF FOOD

Edited by R. T. Parry



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may be vacuum packaged, but it is difficult to remove all the air from the system. Flushing with carbon dioxide removes residual oxygen from the system. Recently, Garout *et al.* (1989) reported an increased storage life for lamb loins and carcasses, packed in carbon dioxide, compared with similar vacuum-packaged meat in consignments transported by air from New Zealand to Saudi Arabia. Given similar chilling conditions, the storage life of CO<sub>2</sub>-packed lamb was about 40 days longer than that of vacuum-packed lamb. Storage life was limited by the development of putrid spoilage, principally due to psychrotrophic enterobacteria.

## 11.6 Retail marketing

### 11.6.1 Consumer cuts

The universal preference for bright-red colour in fresh meat is a major factor in determining the way fresh red meat is packaged for retail sale. This preference is strong in the case of beef and lamb, both of which have a relatively high pigment content, but is less important in pork and veal with their much paler colour. At the point of sale, colour and colour stability are the most important attributes of meat quality and various ways have been used to fulfil consumer expectation that an attractive bright-red colour is compatible with long shelf-life and good eating quality.

There are three types of packaging method suitable for the presentation and display of consumer joints and cuts of meat. These are (i) conventional aerobic overwrapped trays; (ii) MAP, especially using higher levels of oxygen; and (iii) vacuum-packaging. All have been used in the retail market-place to varying extent. The use of vacuum-packaging in retail marketing is limited, due to its purple colour, and attempts to educate consumers to accept the colour on the basis that there is a greatly extended shelf-life have been largely unsuccessful. Nevertheless there is a limited specialised market for the product and interest in the system remains for some marketing situations.

### 11.6.2 Conventionally overwrapped trays

The conventional aerobic method of packaging widely used by supermarkets and other self-service outlets for retail presentation, involves placing the meat in semi-rigid plastic trays, which are then overwrapped with a clear, gas permeable plastic film which readily allows an unrestricted supply of oxygen to the pigment. The film is usually a light-gauge vinyl or polyethylene derivative which combines a low permeability to water vapour and a high permeability to oxygen ( $>10\,000\text{ cm}^3\text{ m}^{-2}\text{ day}^{-1}\text{ atm}^{-1}\text{ O}_2$ ). A wide range of films is currently available commercially for overwrapping trays of meat. All have adequate oxygen permeability and the choice among them is

more likely to be based on price, suitability for use on machines, optical clarity and sealability (Taylor, 1985).

Under the aerobic conditions prevailing in an overwrapped tray, pseudomonads grow readily, and this will lead to relatively rapid spoilage of consumer cuts on retail display. More usually however, the limit to storage life is a result of biochemical discoloration, due to intrinsic enzymic action and oxidation. High bacterial contamination causes an accelerated deterioration in colour, due, initially at least, to competition for available oxygen. A reduction in the partial pressure of oxygen to the critical level for oxidation to metmyoglobin results in the meat turning brown. Development of browning causes 'fading' and a 'tired' appearance of the packaged meat, limiting its display life to a maximum of two to three days. Hood and Kiordan (1973) reported that when packs of discoloured meat sold from a retail display cabinet are compared with similar packs of bright-red meat, there is a considerable bias against the sale of the discoloured meat, equivalent to a ratio of 2:1 when the level of discoloration reaches 20% metmyoglobin. Under normal commercial display, McDougall (1972) found that colour stability limited effective shelf-life to two days depending on the muscle, before oxidising significantly to the unattractive brown metmyoglobin pigment. In practice, supermarkets generally restock every day to ensure the meat on retail display has a fresh appearance. A practical problem is the poor control of temperature that is often achieved in retail display cabinets (Taylor, 1982).

Taylor (1985) points out that overwrapped trays provide an effective thermal insulation so that the meat temperature can be higher than the surroundings. The lighting system in display cabinets can also produce a 'greenhouse' within the pack, heating the exposed surface. The meat must be adequately cooled before packing and careful control of temperature must be maintained not only in the cabinet but also within the package during storage and display. Temperature of storage and display is critical in obtaining maximum shelf-life. At low refrigeration temperature, an increase of 5°C can halve the colour shelf-life, depending on species and muscle. Low-temperature storage, as close as possible to 0°C, is essential to obtain maximum shelf-life. Even at this low temperature the maximum for beef fillet is only about four days (Hood, 1984). Whilst temperature is the single most important factor under practical commercial conditions other factors should also be taken into account. Muscle variability, UV light and length of time post-mortem are among the most important. Some cuts and especially certain muscles have a very short shelf-life with respect to colour stability even under ideal storage conditions, whilst others are significantly better in this respect. Thus, beef from the fillet (*M. psoas major*) has a colour shelf-life of 1-5 days at 5°C, whilst loin steak (*M. longissimus dorsi*) retains a bright-red colour for more than six days at the same temperature (i) Keefe and Hood, 1982).